

LOCAL ANAESTHETIC AGENTS

for office surgery

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Local anaesthetic agents

act by reversibly blocking the passage of molecular ions through the nerve membrane. First, the finer nerve fibres of pain and temperature are blocked, then those of proprioception, followed by those affecting the sensations of touch and pressure .Finally the thicker fibres involved in motor function are blocked .

This sequence is of practical significance. Patients should be told that during the procedure they may feel touch, but there will be no pain. The anaesthetised part and operative site will be insensitive to temperature, and the patient is therefore at risk from burns in the post-operative period.

Patients should alerted to the injection is about to occur and it will sting .They will be told the area is tested before starting to ensure it is working .

The reassuring confident approach - I call it the " psychology of local anaesthesia " helps ensure a successful procedure .

AGENTS

A wide variety of agents are available. There are two main biochemical groups: the amides and the esters.Alteration of molecular structure affects the onset of action, solubility, stability, duration of action and relative toxicity.

Two agents are used almost exclusively in the office setting :

---Lignocaine (Xylocaine) and

-- Bupivacaine (Marcaine).

Both are amides and both are ideally suited to modern packaging and sterilizing techniques.

Maurice uses only lignocaine in the office , whereas in theatre for hernias he mixes this with bupivacaine .Others use bupivacaine routinely in the office especially for digital block on Ingrowing toenails because of its prolonged action . A newer long acting related agent is ropivacaine .It is an advantage to have a command of the use of one or two agents rather than a number of agents. The practitioner will then be fully aware of the characteristics , including dosage and the speed of onset of action.

LIGNOCAINE

Lignocaine, in particular, has a rapid action. With local infiltration it acts almost immediately but still one must wait. It has a slight vasodilator effect, and as a result is rapidly absorbed. It is commonly used with adrenaline, which decreases the rate of absorption and prolongs the effect of Lignocaine. Delay in absorption also reduces the risk of toxicity and allows a larger dose to be used.

Following absorption, Lignocaine is broken down in the liver by the enzymic amidase. A small amount is excreted unaltered in the urine. Local anaesthetic agents can accumulate in the circulation. Their elimination depends on tissue perfusion, circulatory state, hepatic and renal function. Differences can occur between patients even of the same body size. With clinical judgement, these factors should be taken into account and an appropriate margin left for safety.

The generally accepted safe maximum dose for plain Lignocaine is

4mg/kg — 280 mgm in a healthy 70 kg patient. When Adrenalin is used, 7mg/kg is the recommended maximum dosage — approximately 500mg. These doses are only guidelines and are governed by many factors. It is advisable not to approach these doses in the office.

BUPIVACAINE

Bupivacaine has a much longer duration of action (4 hours) with the advantage of prolonged post-operative pain relief. This enables the patient to become mobile earlier and reduces the amount of oral or parenteral narcotic required. Bupivacaine is bound to the tissue longer — making toxic effects more difficult to counteract. It also depresses the heart to a greater extent than lignocaine and is difficult to reverse. Safe doses are 2 mgm/kg: Bupivacaine is not a vasodilator. Adrenaline and thus does not increase dose allowed. To possibly reduce the toxic effects Ropivacaine has been introduced

ADRENALINE

Adrenaline causes vasoconstriction, which prolongs the action of local anaesthetic by decreasing the rate of absorption. This reduces the risk of toxicity. Adrenaline is usually used in a pre-mixed solution with the local, although it may be added to a plain solution just before injection. Adrenaline is used with agents such as Lignocaine, which are shorter acting and have some vasodilating effect. Where patients have poorly controlled hypertension or severe coronary artery disease, the dose of Adrenaline should be reduced or omitted.

Adrenaline has the additional advantage of decreasing bleeding, reducing blood loss, improving operating conditions, but haemostasis should still be obtained.

The procedures demonstrated in Surgical Office Skills, BRYGELS SURGISKILLS usually involve only anaesthetising a small area, e.g. excision of a single skin cancer or one or two lesions or subcutaneous lumps. Where a large area of anaesthesia is required, regional anaesthesia may be more practical, i.e. a major nerve can be blocked without using an excessive amount of local anaesthetic. This requires a more experienced surgeon, possibly sedation and hospitalisation.

COMPLICATIONS

Some patients are very apprehensive about injections, possibly due to previous poor experiences. A history of fainting or pain due to an unsuccessful administration of local anaesthesia is often encountered. Ask specifically about dental anaesthesia. Careful explanation of the reasons for and advantages of local anaesthetic will usually reassure the patient. But generally give patients an option

1. Fainting is a common problem in apprehensive patients. Fear may be so intense that the patient becomes sweaty and has a vasovagal attack, sometimes even while discussing the prospect of surgery. There may be a history of previous fainting episodes during dentist treatment
2. Allergic reaction to local anaesthetic agents is rare but does occur, and can be fatal. Any shortness of breath, itchiness and swelling should be taken seriously. Prompt and effective treatment with adrenalin is essential and best administered slowly intravenously as a 1:10,000 solution (an IMS MINIJET preparation is available).
3. Equipment failure is rare with modern packaging techniques. Infection due to poorly sterilised equipment, or from leaving a needle in situ should never occur. Check the concentration, but don't forget to check the expiry date
4. Toxicity is determined by the concentration, the total dose and the rate of absorption or accumulation in the circulation. Inadvertent injection directly into the vein, described as a 'bolus' effect, is most dangerous. A 2% solution 2 gram per 100ml, (200 mg in 10 ml) is more likely to cause a toxic affect than 200 mg given as a 1% solution, (200 mg in 20 ml) particularly if inadvertent intravenous injection occurs.

With adrenaline lignocaine dosages can be increased to 7 mg

Sequelae may manifest almost immediately without any warning, or may slowly develop, with early warning signs. Minimal signs of toxicity often go unnoticed.

The earliest signs of a relative overdose with lignocaine are numbness, particularly around the lips, twitchiness, then focal convulsions or a full convulsion, loss of consciousness, with cessation of breathing and possibly cardiac arrest.

All agents, but particularly, Bupivacaine ®, reduce myocardial excitability and prolong conduction time; some have a vasodilator effect. This may lead to a fall in blood pressure, depression of the myocardium, and can directly cause cardiac arrest.

Respiratory effects, e.g. changes in the respiratory rate, are usually secondary to the effect on the central nervous system. Early manifestations of drowsiness or excitability, altered or slurred speech, must be taken seriously. Differing agents have a different propensity to cause adverse effects.

Sedation may reduce the risk of convulsion. The risks of toxicity are reduced by careful administration, minimal affective dosage and repeated aspiration to ensure the injection is not given as a bolus intravenously. Keeping the needle moving and a familiarity with the location of vessels reduces risk. The age of the patient should be considered

5. Infection: local anaesthetic is less effective in the presence of infection. An injection of local anaesthetic into an infected site e.g. for the drainage of a small abscess, is common practice. There is the theoretical possibility when injecting the local anaesthetic of spreading the infection

Local anaesthetics

are less effective in infected areas, because the lower PH present in the tissues favours the enzymic hydrolysis of the local anaesthetic, and the greater blood flow increases absorption of the local anaesthetic. Antibiotics should be used in the likelihood of spreading infection .

POINTERS

- Assess the patient regarding suitability for the procedure .
- Medical and psychological conditions may preclude some patients.
- Infants and younger children do not cope as well with operations under local anaesthetic.
- EXTRA care and reduced dosages is needed in infants to avoid toxicity .
- Beware of additive effects .E.g injecting ,then using topical skin or mucosal spray .
- Ensure patient comfort and understanding — before, during and after the procedure.
- The commonest alarming problem is a vasovagal or fainting episode.
- It is advisable to set up an intravenous line for a major nerve block .- more likely to be a day care facility
- A thorough knowledge and understanding of one or two local anaesthetic agents is better than a superficial knowledge of many.

- Inject the local anaesthetic agent slowly. Rapid injection may produce a bolus effect and increase the chance of toxicity.
- Allow sufficient time for the local anaesthetic agent to act, rather than injecting more, too soon. Always test before incising .
- A potential complication, with the use of local anaesthesia, is the spread of existing infection. Use of contaminated equipment may introduce infection.
- Local anaesthesia is less effective in the presence of infection because of the acidic environment and increased blood flow causing increased rate of absorption .

• CONCLUSION -----

- THERE ARE MANY ADVANTAGES in the use of local ANAESTHETIC rather than general ,for both office procedures and hospital cases .
- I coined the term " GAS LAG " to describe the after effects of a general ,comparing it to "JET LAG ". There have been extensive studies to confirm the efficacy of local .
- This is just one reason why THE MELBOURNE HERNIA CLINIC advocates hernia repair using local with sedation rather than general .
- Thus local anaesthesia is an essential tool in the office enabling safe , cost and time effective surgery .

• TOPICAL ANAESTHESIA

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- There are other methods of achieving local anaesthesia ,using sprays and applications ,particularly for mucosal surfaces
- Benzocaine is the main agent - these are generally derivatives of cocaine .Used in mucosal,oral ,nasal cavities and the eye
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- EMLA cream - an Eutetic Mixture of Local Anaesthetic (EMLA) - lignocaine and prilocaine . For reducing the pain of injection .Takes half an hour to work .rather costly but very effective for children and certain circumstances .

• SOME POINTERS REGARDING LIGNOCAINE

- Lignocaine is an acidic solution . Lignocaine is kept acidic to maintain it in solution and prevent precipitation . THIS ACIDIC MIXTURE STINGS MORE
- There are strategies for reducing the sting ----and the physiological basis is
- Lignocaine is an acidic solution by necessity to allow storage as a solution and prevent precipitation .On injection the ionic charges alter in the neutral P.H of the tissues ,thus increasing the lipid solubility ,facilitating diffusion ,reducing sodium exchange ,causing depolarization and blocking the action potential of the nerve .

The acid P.H stings more and thus adding bicarbonate reduces the sting and also speeds rate of penetration of the nerve cell membrane . Even warming makes it more alkaline and reduces the sting and makes it more effective .Many say these effects are marginal .

The acidic, highly vascular environment of infection , renders the lignocaine less effective because the local is rapidly cleared in the acidic environment .

THUS IN CONCLUSION this article is designed to give background and tips in the use of local anaesthesia which is such an integral part of any procedures carried out in the office .

- While as doctors we often ' just use ".the local it is helpful to understand the mechanisms at work ,which will instill greater confidence ,professionalism and success.
- Hope you enjoy our workshops .
- By the new year we will be launching on line subscription courses ,the first on digital block and Ingrowing toenails
- Morry Brygel